EXHIBIT B

Multiple Access Communication System, Method of Managing a Multiple Access Communication System and Processing Means

Description

Field of the Invention:

The present invention relates to a multiple access communication system with at least two different access systems, wherein a first access system is capable of handling a first number of communications between a mobile user equipment and the first access system and wherein a second access system is capable of handling a second number of communications between the mobile user equipment and the second access system.

The invention further relates to a method for managing a multiple access communication system with at least two different access systems, wherein a first access system is capable of handling a first number of communications between a mobile user equipment and the first access system and wherein a second access system is capable of handling a second number of communications between the mobile user equipment and the second access system.

Multiple access communication systems such as cellular and/or satellite based telephone systems have developed significantly in operations world-wide.

An important example of a multiple access communication system with a first access system and a second access system is an

implementation of so-called „islands" of a new access system within an already existing access system. However, the invention is not limited to implementations of a new access system within an already existing access system, but applies to any multiple access communication system with at least two different access systems. For example, the invention also includes the case that a communication system is equipped differently within different service areas, for example to give users within cities a higher service quality than in rural regions.

Current multiple access communication systems are capable of handling one communication for each mobile user equipment. Future multiple access communication systems will allow mobile user equipments to perform a greater number of communications simultaneously. Examples of the communication are telephone calls, faxes, downloading of data or uploading of data (file transfer). However, the invention is not limited to this examples. According to the invention communication is not limited to any special form of transfer, neither to information transfer with establishing a connection nor to connectionless information transfer. According to the invention communication includes connections as well as connectionless signalling as for example Short Messaging Service (SMS). Future wireless scenarios for wideband wireless multimedia services can comprise: interactive news delivery (voice, video, E-mail, graphics, interactive E-mail (text, graphics, video clips), Interactive audio (CD-quality voice, video, graphics), video conferencing, web browsing, dynamic Internet-based games, downloading large files from intranets or position/location-dependent "push" info.

It is an object of the invention to create a multiple access

communication system with a first access system and a second access system, wherein at least one of the access systems allows the mobile user equipment to perform more than one communication, wherein a handover of communication between the first access system and the second access system is possible.

A short come of the known system is that a handover between the first access system and the second access system is not possible.

This problem will be solved advantageously by the system of claim 1, the method of claim 15, ~~the means for making a decision of claim ..., the means for executing the decision and the mobile user equipment of claim ...~~

A further object of the invention is a method for managing a multiple access communication system with at least two different access systems, wherein a first access system is capable of handling a first number of communications between a mobile user equipment and the first access system and wherein a second access system is capable of handling a second number of communications between the mobile user equipment and the second access system, which is carried out in a way that it is evaluated if a handover from the first access system to the second access system should be effected and that in the case that the handover is necessary maximally the second number of communications are handed over.

Another object of the invention is to supply processing means for a multiple access communication system.

A further object of the invention is a mobile user equipment, capable of communicating in a multiple access communication

system with at least two different access systems.

Further advantageous embodiments and implementations are achieved according to the claims 2 to 11, 13 to 30, ... and ... to ....

The invention makes use of the idea to distinguish between different communications and/or different types of communication. Thus the invention allows the communication system and/or the mobile user equipment to handover different communications and/or different types of communication in a different manner.

According to the invention, the problem is solved by a multiple access communication system with at least two different access systems, wherein a first access system is capable of handling a first number of communications between a mobile user equipment and the first access system and wherein a second access system is capable of handling a second number of communications between the mobile user equipment and the second access system, characterised in that the mobile user equipment and/or the communication system contains at least one means for making a decision which is capable of deciding which communications are handed over in the case that the mobile user equipment would move between the first access system and the second access system and in that the mobile user equipment and/or the communication system contain at least one means for executing the decision.

The mobile user equipment is capable of handing over at least one communication from the first access system to the second access system. Each of the access systems is capable of handling a certain number of communications for each of the

mobile user equipments. A limitation of the number of communications originates for example in technical constraints as in the conventional GSM system, which is capable of handling only one communication for the mobile user equipment. However, even systems which principally would allow a higher number of simultaneous communications for each of the mobile user equipments could be limited permanently or temporarily to a certain number of communications for each of the mobile user equipments.

Whereas a handover between an access system, which allows a lower number of simultaneous communications to an access system, which allows a higher number of simultaneous communications does not evoke problems, the handover in different directions is difficult.

The invention allows a management of different communications of a mobile user equipment which passes from a first access system with at least two, preferably more simultaneous communications to another access system allowing a lower number of simultaneous communications for each of the mobile user equipments.

For example, the first access system is constituted by a Universal Mobile Telecommunication System (UMTS) and the second access system is a Global System for Mobile Telecommunication (GSM), or an Universal Mobile Telecommunication System (UMTS) which allows a lower number of simultaneous communications as the first access system.

The mobile user equipment is, for example, a mobile computer capable of communicating, a mobile telephone apparatus or a mobile multimedia system.

In an advantageous implementation of the communication system, the method, the processing means, and the mobile user equipment, the communication system contains at least one means for determining a capability of the communication system.

In a preferred embodiment of the communication system, the method, the processing means, and the mobile user equipment, the means for determining the capability is located in a core network.

In an advantageous implementation of the communication system, the method, the processing means, and the mobile user equipment, at least one access network of the communication system contains the means for executing the decision.

In a preferred embodiment of the communication system, the method, the processing means, and the mobile user equipment, a core network contains the means for executing the decision.

In a further advantageous implementation of the communication system, the method, the processing means, and the mobile user equipment, the mobile user equipment contains the means for executing the decision.

In a preferred embodiment of the communication system, the method, the processing means, and the mobile user equipment, at least one access network of the communication system contains the means for making a decision.

In a further advantageous implementation of the communication system, the method, the processing means, and the mobile user equipment, a core network contains the means for making a

decision.

In a preferred embodiment of the communication system, the method, the processing means, and the mobile user equipment, the mobile user equipment contains the means for making a decision.

In a preferred embodiment of the communication system, the method, the processing means, and the mobile user equipment, it contains a means for deciding whether a handover is necessary.

In an advantageous implementation of the communication system, the method, the processing means, and the mobile user equipment, the means for deciding whether a handover is necessary is a device (DPH).

In a further advantageous implementation of the communication system, the method, the processing means, and the mobile user equipment, the device (DPH) is located in an access network (AN).

In an advantageous implementation of the communication system, the method, the processing means, and the mobile user equipment, the device (DPH) is located in a Mobile Services Switching Centre.

In a further advantageous implementation of the communication system, the method, the processing means, and the mobile user equipment, the device (DPH) is located in a Base Transceiver Station.

The Mobile Services Switching Centre (MSSC) and one or more

Basic Transceiver Stations (BSC) constitute an access network of the communication system. Within an implementation of a Global System for Mobile Communication (GSM) every mobile user equipment is in contact with one Base Transceiver Station (BTS). In other access systems like implementations of a Universal Mobile Telecommunication System (UMTS) each of the mobile user equipments may be in a contact with more than one Base Transceiver Station (BTS).

In a preferred embodiment of the communication system, the method, the processing means, and the mobile user equipment, it is evaluated if a handover from the first access system to the second access system should be effected, wherein in the case that the handover is necessary communications are handed over.

In an advantageous implementation of the communication system, the method, the processing means, and the mobile user equipment, an access network sends a handover query to the mobile user equipment.

In a preferred embodiment of the communication system, the method, the processing means, and the mobile user equipment, before the access network sends the handover query to the mobile user equipment, the access network signals a core network.

In a further advantageous implementation of the communication system, the method, the processing means, and the mobile user equipment, the core network adds information about communications which can be supported.

In a preferred embodiment of the communication system, the

method, the processing means, and the mobile user equipment, the mobile user equipment informs the access network about the communication or the communications which should be handed over to the second access system.

In an advantageous implementation of the communication system, the method, the processing means, and the mobile user equipment, the mobile user equipment informs the access network about the communication or the communications which should be handed over to the second access system at a communication set-up.

In a preferred embodiment of the communication system, the method, the processing means, and the mobile user equipment, the mobile user equipment receives a handover query for handover towards the second access system, the mobile user equipment disconnects all connections, that it cannot keep in the second access system.

In a further advantageous implementation of the communication system, the method, the processing means, and the mobile user equipment, the core network decides which communications shall be handed over to the second access system.

In a preferred embodiment of the communication system, the method, the processing means, and the mobile user equipment, the core network disconnects all calls which can not be kept in the second access system.

In an advantageous implementation of the communication system, the method, the processing means, and the mobile user equipment, at least one decision about communications which are handed over in the case that the mobile user equipment

(MUE) would move between the first access system and the second access system depends on at least one pre-setting.

In a preferred embodiment of the communication system, the method, the processing means, and the mobile user equipment, the pre-setting is located within a mobile user equipment.

In an advantageous implementation of the communication system, the method, the processing means, and the mobile user equipment, the pre-settings are transferred to the core network within an ... (IOE) message and/or in a set-up message.

In a further advantageous implementation of the communication system, the method, the processing means, and the mobile user equipment, a message which depends on the pre-setting is sent to the core network after the core network has sent a request to the mobile user equipment.

In a preferred embodiment of the communication system, the method, the processing means, and the mobile user equipment, the message depends only on the pre-setting.

In an advantageous implementation of the communication system, the method, the processing means, and the mobile user equipment, the message depends also on an active decision of a mobile user.

In a further advantageous implementation of the communication system, the method, the processing means, and the mobile user equipment, the pre-setting is stored within the network.

In a preferred embodiment of the communication system, the

method, the processing means, and the mobile user equipment, the pre-setting depends on individual profiles for mobile users.

In an advantageous implementation of the communication system, the method, the processing means, and the mobile user equipment, the pre-setting is identical for all users.

In a preferred embodiment of the communication system, the method, the processing means, and the mobile user equipment, the pre-setting differentiates between different categories of communications.

An example for a preferred category are emergency calls.

In a further advantageous implementation of the communication system, the method, the processing means, and the mobile user equipment, at least one of the communications is put on hold before the handover and kept on hold after the handover.

The invention also solves the problem to hand over multi-party calls. If one or more communication is put on hold, it is possible to reactivate the communication at a later time. However, the method of putting at least one communication on hold before the handover, to keep it on hold after the handover and to reactivate the communication at a later moment also applies to other communications as data communications. For example, if a mobile user equipment with an activated speech call and an activated down load of a file moves towards an access system which allows only one simultaneous communication, the data communication is put on hold and reactivated later, especially after the mobile user equipment has finished the speech call or has once again moved towards a

third access system which allows more than one simultaneous communication.

In a preferred embodiment of the communication system, the method, the processing means, and the mobile user equipment, a mobile user is informed before the handover. This allows a decision of the mobile user about communications he would like to maintain.

In the following the invention will be further described by means of examples and by means of the figures.

Fig. 1 shows sequences for a first implementation of a handover procedure according to the invention.

Fig. 2 shows sequences for a second implementation of a handover procedure according to the invention.

Fig. 3 shows sequences for a third implementation of a handover procedure according to the invention.

Fig. 4 shows sequences for a fourth implementation of a handover procedure according to the invention.

Fig. 5 shows sequences for a fifth implementation of a handover procedure according to the invention.

Fig. 6 shows sequences for a sixth implementation of a handover procedure according to the invention.

Fig. 7 shows sequances for a seventh implementation of a handover procedure according to the invention.

Fig. 8 shows sequences for an eighth implementation of a handover procedure according to the invention.

According to figures 1, 2, 3, 4, 5, 6, 7 and 8 the present invention is described in conjunction with a handover from a Universal Mobile Telecommunication System (UMTS) as a first access system and a Global System for a Mobile Communication System (GSM). However, the examples are not limited to a handover from a Universal Mobile Telecommunication System (UMTS) to a Global System for Mobile Communication (GSM) but include all types of handover between an access system with a high number of simultaneous communications to an access system with a lower number of simultaneous communications.

Means for making a decision which are capable of making a decision which communications are handed over in the case that a mobile user equipment MUE would move between the first access system and the second access system are afterwards described by an logical element. Means for executing the decision are afterwards described by examples of execution elements EE. The elements may be realised physically or virtually.

The sequences according to the figures 1, 2, 3, 4, 5, 6, 7 or 8 are only a part of signal transfer processes. Preferably the sequences are exchanged in a way which can be described as signalling within one or more layer. Examples of these layers are: physical layer, data link layer, network layer, transport layer, session layer, presentation layer and application layer.

To achieve an efficient handover from UMTS to GSM different solutions to decide whether the handover is necessary may be

implemented. Each of them could be combined with each of the sequences according to the figures 1, 2; 3, 4, 5, 6, 7 or 8.

It is preferred, that at least one message includes a measurement control MCT. A measurement control MCT is carried out most advantageously in one of the following manners: An access node AN commands a mobile user equipment MUE to perform measurements. The type of measurements may be adapted to physical parameters of the access systems. Examples of the measurements are:

Radio link measurements. In this case measurements are performed on down link radio links in an active set.

Intra-frequency measurements. In this case measurements on down link physical channels that do not belong to the active set but have the same frequency as the active set are performed.

Inter-frequency measurements. In this case measurements on down link physical channels with frequencies that differ from the frequency of the active set are performed.

Inter-system measurements. In this case measurements on down link physical channels belonging to another radio access system than the access network AN are performed.

Traffic volume measurements. In this case measurements on up link traffic volume are performed.

Afterwards the mobile user equipment MUE gives a measurement report to the access network AN.

The described procedures are performed within the described examples as steps 1, 2 and 3. Whereas these steps 1, 2, 3 in the figures 1, 2, 3, 4, 5, 6, 7 and 8 are advantageous, they are not necessary to perform the afterwards described steps.

Fig. 1 shows a first advantageous implementation of the invention.

Before a communication is established between a mobile user equipment MUE and a first access system of a communication system, the communication is set up.

Actual propositions for standards include at least one set-up message for each communication. If a first number n of communications is established, n set-up messages SU are transmitted. However, to facilitate the understanding of the figure, the set-up messages SU are represented by one arrow. Effectively, the set-up message SU is repeated n times.

Afterwards and/or simultaneously an access network AN of the first access system, especially a Universal Mobile Telecommunication System UMTS, commands the mobile user equipment MUE to perform measurements

The type of measurements is adapted to physical parameters of the access systems. Examples of the measurements are: radio link measurements, intra-frequency measurements, Inter-frequency measurements, or traffic volume measurements.

A measurement report MRT is send from the mobile user equipment MUE to the access network AN.

The access network AN contains a device DPH, capable of

deciding, whether a handover is necessary and a logical element LE for deciding which communications are to be handed over.

If the device DPH decides, that a handover is necessary, the procedure continues as described below.

The access network AN informs a core network CN that a handover is required by at least one handover request signal HRQ.

The core network CN contains an execution element EE for executing the handover.

The core network CN informs a base station controller BSC of the second access system, especially a Global System for Mobile Communication GSM, that it requests a handover. The signal is one step according to the sequence-diagram represented in fig. 1.

Afterwards the base station controller BSC sends a message for handover request acceptance HREA to the core network CN.

Within the first access system, especially a Universal Mobile Telecommunication System UMTS a handover command HCM is send to the access network AN of the first access system.

The access network AN transmits afterwards the handover command HCM to the mobile user equipment MUE. The mobile user equipment MUE sends a handover access HAC to the base station controller BSC.

The base station controller BSC send afterwards a handover

detect signal HDT to the core network CN.

After completing the handover the mobile user equipment MUE sends a handover complete HCP signal to the base station controller BSC.

The base station controller BSC sends the handover complete signal HCP to the core network CN.

Before a communication between a mobile user equipment MUE and a first access system of a communication system is disconnected, it is necessary, to release the communication.

If a first number n of communications has been established and a second, lower number m of communications is handed over, n-m communications have to be released.

For each communication which is not handed over, a release command RCM and a release complete signal RCP are send. The release command RCM is send from the core network CN to the mobile user equipment MUE. The release complete signal RCP is send from the mobile user equipment MUE to the core network CN.

Effectively, the release command RCM and the release complete signal RCP are repeated n-m times to release n-m communications. However, to facilitate the understanding of the figure, the release command RCM and the release complete signal RCP set-up messages SU are represented by two arrows.

To clear the communications which are not handed over, the core network CN sends a clear command CCM to the access network AN. The access network AN signals afterwards a clear

complete CCP signal to the core network.

Fig. 2 shows a second advantageous implementation of the invention.

Before a communication is established between a mobile user equipment MUE and a first access system of a communication system, the communication is set up.

If a first number n of communications is established, n set-up messages SU are transmitted. However, to facilitate the understanding of the figure, the set-up messages SU are represented by one arrow. Effectively, the set-up message SU is repeated n times.

Afterwards and/or simultaneously an access network AN of the first access system, especially a Universal Mobile Telecommunication System UMTS, commands the mobile user equipment MUE to perform measurements.

The type of measurements is adapted to physical parameters of the access systems. Examples of the measurements are: radio link measurements, intra-frequency measurements, inter-frequency measurements, or traffic volume measurements.

A measurement report MRT is send from the mobile user equipment MUE to the access network AN.

The access network AN contains a device DPH, capable of deciding, whether a handover is necessary.

If the device DPH decides, that a handover is necessary, the

procedure continues as described below.

The access node informs a core network CN that a handover is required by at least one handover request signal HRQ.

The core network CN contains a logical element LE for deciding which communications are handed over and an execution element EE for executing the handover.

The core network CN informs a base station controller BSC of the second access system, especially a Global System for Mobile Communication GSM, that it requests a handover. The signal is the fourth step according to the sequences represented in fig. 2.

Afterwards the base station controller BSC sends a message for handover request acceptance HREA to the core network CN.

Within the first access system, especially a Universal Mobile Telecommunication System UMTS a handover command HCM is send to the access network AN of the first access system.

The access network AN transmits afterwards the handover command HCM to the mobile user equipment MUE. The mobile user equipment MUE sends a handover access HAC to the base station controller BSC.

The base station controller BSC send afterwards a handover detect signal HDT to the core network CN.

After completing the handover the mobile user equipment MUE sends a handover complete HCP signal to the base station controller BSC.

The base station controller BSC sends the handover complete signal HCP to the core network CN.

Before a communication between a mobile user equipment MUE and a first access system of a communication system is disconnected, it is necessary, to release the communication.

If a first number n of communications has been established and a second, lower number m of communications is handed over, n-m communications have to be released.

For every communication which is not handed over, a release command RCM and a release complete signal RCP are send. The release command RCM is send from the core network CN to the mobile user equipment MUE. The release complete signal RCP is send from the mobile user equipment MUE to the core network CN.

Effectively, the release command RCM and the release complete signal RCP are repeated n-m times to release n-m communications. However, to facilitate the understanding of the figure, the release command RCM and the release complete signal RCP set-up messages SU are represented by one arrow.

To clear the communications which are not handed over, the core network CN sends a clear command CCM to the access network AN. The access network AN signals afterwards a clear complete CCP signal to the core network.

Fig. 3 shows a third advantageous implementation of the invention.

This implementation makes use of the concept, that a mobile user equipment MUE sends to a core network CN of a communication system information ICK about calls to keep. The information ICK could be - depending on a service value of the communication system - a preference or a definitive order to hand over certain calls.

In this preferred implementation, the information ICK about calls to keep is send before the communications are established. However, sending the information ~~ICK~~ about calls to keep later, is also possible too. in the setup message

After the information ICK about calls to keep has been sent from the mobile user equipment MUE to the core network CN of the communication system, the core network CN could send an acknowledge signal ACK to the mobile user equipment MUE.

Before a communication is established between a mobile user equipment MUE and a first access system of a communication system, the communication is set up.

If a first number n of communications is established, n set-up messages SU are transmitted. However, to facilitate the understanding of the figure, the set-up messages SU are represented by one arrow. Effectively, the set-up message SU is repeated n times.

Afterwards and/or simultaneously the access network AN commands the mobile user equipment MUE to perform measurements.

The type of measurements is adapted to physical parameters of the access systems. Examples of the measurements are: radio

link measurements, intra-frequency measurements, Inter-frequency measurements, or traffic volume measurements.

A measurement report MRT is send from the mobile user equipment MUE to the access network AN.

The access network AN contains a device DPH, capable of deciding, whether a handover is necessary and ~~a logical element LE for deciding which communications are handed over~~

If the device DPH decides, that a handover is necessary, the procedure continues as described below.

The access network AN informs a core network CN that a handover is required by at least one handover request signal HRQ.

The core network CN contains an execution element EE for executing the handover.

The core network CN informs a base station controller BSC of the second access system, especially a Global System for Mobile Communication GSM, that it requests a handover. The signal is the seventh step according to the sequence represented in fig. 1.

Afterwards the base station controller BSC sends a message for handover request acceptance HREA to the core network CN.

Within the first access system, especially a Universal Mobile Telecommunication System UMTS a handover command HCM is send to the access network AN of the first access system.

The access network AN transmits afterwards the handover command HCM to the mobile user equipment MUE. The mobile user equipment MUE sends a handover access HAC to the base station controller BSC.

The base station controller BSC sends afterwards a handover detect signal HDT to the core network CN.

After completing the handover the mobile user equipment MUE sends a handover complete HCP signal to the base station controller BSC.

The base station controller BSC sends the handover complete signal HCP to the core network CN.

Before a communication between the mobile user equipment MUE and the first access system of a communication systemis disconnected, it is necessary, to release the communication.

If a first number n of communications has been established and a second, lower number m of communications is handed over, n-m communications have to be released.

For every communication which is not handed over, a release command RCM and a release complete signal RCP are send. The release command RCM is sand from the core network CN to the mobile user equipment MUE. The release complete signal RCP is send from the mobile user equipment MUE to the core network CN.

Effectively, the release command RCM and the release complete signal RCP are repeated n-m times to release n-m communications. However, to facilitate the understanding of

the figure, the release command RCM and the release complete signal RCP set-up messages SU are represented by two arrows.

To clear the communications which are not handed over, the core network CN sends a clear command CCM to the access network AN. The access network AN signals afterwards a clear complete CCP signal to the core network.

Fig. 4 shows a fourth advantageous implementation of the invention.

Before a communication is established between a mobile user equipment MUE and a first access system of a communication system, the communication is set up.

If a first number n of communications is established, n set-up messages SU are transmitted. However, to facilitate the understanding of the figure, the set-up messages SU are represented by one arrow. Effectively, the set-up message SU is repeated n times.

Afterwards and/or simultaneously an access network AN of the first access system, especially a Universal Mobile Telecommunication System UMTS, commands the mobile user equipment MUE to perform measurements.

The type of measurements is adapted to physical parameters of the access systems. Examples of the measurements are: radio link measurements, intra-frequency measurements, inter-frequency measurements, or traffic volume measurements.

A measurement report MRT is send from the mobile user equipment MUE to the access network AN.

The access network AN contains a device DPH, capable of deciding, whether a handover is necessary.

The mobile user equipment MUE contains a logical element LE, which is which is capable of making a decision which communications are handed over.

If the device DPH decides, that a handover is necessary, the procedure continues as described below.

A handover query HQ is signalled from the access network AN to the mobile user equipment MUE. Afterwards the mobile user equipment sends a handover response HRP to the access network AN. The access network AN informs a core network CN that a handover is required by at least one handover request signal HRQ.

The core network CN informs a base station controller BSC of the second access system, especially a Global System for Mobile Communication GSM, that it requests a handover by sending a handover request signal HRE to the base station controller BSC.

Afterwards the base station controller BSC sends a message for handover request acceptance HREA to the core network CN.

Within the first access system, especially a Universal Mobile Telecommunication System UMTS, a handover command HCM is send to the access network AN of the first access system.

The access network AN transmits afterwards the handover command HCM to the mobile user equipment MUE. The mobile user equipment MUE sends a handover access HAC to the base station controller BSC.

The base station controller BSC sends afterwards a handover detect signal HDT to the core network CN.

After completing the handover the mobile user equipment MUE sends a handover complete HCP signal to the base station controller BSC.

The base station controller BSC sends the handover complete signal HCP to the core network CN.

Before a communication between a mobile user equipment MUE and a first access system of a communication system is disconnected, it is necessary, to release the communication.

If a first number n of communications has been established and a second, lower number m of communications is handed over, n-m communications have to be released.

For every communication which is not handed over, a release command RCM and a release complete signal RCP are send. The release command RCM is send from the core network CN to the mobile user equipment MUE. The release complete signal RCP is send from the mobile user equipment MUE to the core network CN.

Effectively, the release command RCM and the release complete signal RCP are repeated n-m times to release n-m communications. However, to facilitate the understanding of

the figure, the release command RCM and the release complete signal RCP set-up messages SU are represented by two arrows.

To clear the communication the core network CN sends a clear command CCM to the access network AN. The access network AN signals afterwards a clear complete CCP signal to the core network.

Fig. 5 shows a fifth advantageous implementation of the invention.

Before a communication is established between a mobile user equipment MUE and a first access system of a communication system, the communication is set up.

If a first number n of communications is established, n set-up messages SU are transmitted. However, to facilitate the understanding of the figure, the set-up messages SU are represented by one arrow. Effectively, the set-up message SU is repeated n times.

Afterwards and/or simultaneously an access network AN of the first access system, especially a Universal Mobile Telecommunication System UMTS, commands the mobile user equipment MUE to perform measurements.

The type of measurements is adapted to physical parameters of the access systems. Examples of the measurements are: radio link measurements, intra-frequency measurements, Inter-frequency measurements, or traffic volume measurements.

A measurement report MRT is send from the mobile user

equipment MUE to the access network AN.

The access network AN contains a device DPH, capable of deciding, whether a handover is necessary.

The mobile user equipment MUE contains a logical element LE, which is which is capable of making a decision which communications are handed over.

If the device DPH decides, that a handover is necessary, the prooedure continues as described below.

The access network AN sends a capability request to the core network CN. The core network CN contains a capability analysis element CAE, which performs measurements and/or calculation about capabilities in the network. Thus, the capability analysis element CAE is a means for determing a capability of the network.

A content of a capability answer CA, which is afterwards send to the access network AN depends on a capability which the capability analysis element CAE has notified as available.

A handover query HQ is signalled from the access network AN to the mobile user equipment MUE. Afterwards the mobile user equipment sends a handover response HRP to the access network AN. The access network AN informs a core network CN that a handover is required by at least one handover request signal HRQ.

The core network CN informs a base station controller BSC of the second access system, especially a Global System for Mobile Communication GSM, that it requests a handover by

sending a handover request signal HRE to the base station controller BSC.

Afterwards the base station controller BSC sends a message for handover request acceptance HREA to the core network CN.

Within the first access system, especially a Universal Mobile Telecommunication System UMTS, a handover command HCM is send to the access network AN of the first access system.

The access network AN transmits afterwards the handover command HCM to the mobile user equipment MUE. The mobile user equipment MUE sends a handover access HAC to the base station controller BSC.

The base station controller BSC sends afterwards a handover detect signal HDT to the core network CN.

After completing the handover the mobile user equipment MUE sends a handover complete HCP signal to the base station controller BSC.

The base station controller BSC sends the handover complete signal HCP to the core network CN.

Before a communication between a mobile user equipment MUE and a first access system of a communication system is disconnected, it is necessary, to release the communication.

If a first number n of communications has been established and a second, lower number m of communications is handed over, n-m communications have to be released.

For every communication which is not handed over, a release command RCM and a release complete signal RCP are send. The release command RCM is send from the core network CN to the mobile user equipment MUE. The release complete signal RCP is send from the mobile user equipment MUE to the core network CN.

Effectively, the release command RCM and the release complete signal RCP are repeated n-m times to release n-m communications. However, to facilitate the understanding of the figure, the release command RCM and the release complete signal RCP set-up messages SU are represented by two arrows.

To clear the communication the core network CN sends a clear command CCM to the access network AN. The access network AN signals afterwards a clear complete CCP signal to the core network.

According to fig. 6 an alternative solution is described in which a mobile user equipment contains a logical element LE and an execution element EE.

Before a communication is established between a mobile user equipment MUE and a first access system of a communication system, the communication is set up.

If a first number n of communications is established, n set-up messages SU are transmitted. However, to facilitate the understanding of the figure, the set-up messages SU are represented by one arrow. Effectively, the set-up message SU is repeated n times.

Afterwards and/or simultaneously an access network AN of the first access system, especially a Universal Mobile Telecommunication System UMTS, commands the mobile user equipment MUE to perform measurements.

The type of measurements is adapted to physical parameters of the access systems. Examples of the measurements are: radio link measurements, intra-frequency measurements, Inter-frequency measurements, or traffic volume measurements.

A measurement report MRT is send from the mobile user equipment MUE to the access network AN.

The access network AN contains a device DPH, capable of deciding, whether a handover is necessary.

The mobile user equipment MUE contains a logical element LE, which is capable of making a decision which communications are handed over.

If the device DPH decides, that a handover is necessary, the procedure continues as described below.

The access network AN may send a capability request CRQ to the core network CN. The core network CN contains a capability analysis element CAE, which performs measurements and/or calculation about capabilities in the network. Thus, the capability analysis element CAE is a means for determing a capability of the network.

A content of a capability answer CA, which is afterwards send to the access network AN depends on a capability which the capability analysis element CAE has notified as available.

The capability analysis element CAE as well as the capability request CRQ and the capability answer CA are advantageous but not necessary.

A handover query HQ is signalled from the access network AN to the mobile user equipment MUE. Afterwards the mobile user equipment sends a handover response HRP to the access network AN.

A mobile user decides to remain within the first access system after he has been informed that at least one of the communications of the mobile user equipment MUE would be interrupted in the case of a handover.

A preferred embodiment of the invention which is described according to fig. 7 includes a logical element LE within a mobile user equipment MUE. The logical element LE is capable of making a decision which communications are handed over in the case that the mobile user equipment MUE would move between a first access system and a second access system.

Before a communication is established between the mobile user equipment MUE and the first access system of the communication system, the communication is set up.

If a first number n of communications is established, n set-up messages SU are transmitted. However, to facilitate the understanding of the figure, the set-up messages SU are represented by one arrow. Effectively, the set-up message SU is repeated n times.

As a part of the set-up message SU the mobile user equipment MUE informs the access network AN about communications that should be handed over.

The access network AN contains a device DPH, capable of deciding, whether a handover is necessary.

If the device DPH decides, that a handover is necessary, the procedure continues as described below.

The access network AN informs a core network CN that a handover is required by at least one handover request signal HRQ.

The core network CN contains an execution element EE for executing the handover.

The core network CN informs a base station controller BSC of a second access system, especially a Global System for Mobile Communication GSM, that it requests a handover by sending a handover request signal HRE to the base station controller BSC.

Afterwards the base station controller BSC sends a message for handover request acceptance HREA to the core network CN.

Within the first access system, especially a Universal Mobile Telecommunication System UMTS a handover command HCM is send to the access network AN of the first access system.

The access network AN transmits afterwards the handover command HCM to the mobile user equipment MUE. The mobile user equipment MUE sends a handover access HAC to the base station

controller BSC.

The base station controller BSC sends afterwards a handover detect signal HDT to the core network CN.

After completing the handover the mobile user equipment MUE sends a handover complete signal HCP to the base station controller BSC.

The base station controller BSC sends the handover complete signal HCP to the core network CN.

Before a communication between a mobile user equipment MUE and a first access system of a communication system is disconnected, it is necessary, to release the communication.

If a first number n of communications has been established and a second, lower number m of communications is handed over, n-m communications have to be released.

For every communication which is not handed over, a release command RCM and a release complete signal RCP are send. The release command RCM is send from the core network CN to the mobile user equipment MUE. The release complete signal RCP is send from the mobile user equipment MUE to the core network CN.

Effectively, the release command RCM and the release complete signal RCP are repeated n-m times to release n-m communications. However, to facilitate the understanding of the figure, the release command RCM and the release complete signal RCP set-up messages SU are represented by two arrows.

To clear the communication the core network CN sends a clear command CCM to the access network AN. The access network AN signals afterwards a clear complete signal CCP to the core network.

In the preferred embodiments of the invention which are described according to fig. 8 a mobile user equipment MUE contains a logic element LE as well as an execution element EE for executing handover.

Before a communication is established between the mobile user equipment MUE and a first access system, especially a Universal Mobile Telecommunication System UMTS, of the communication system, the communication is set up.

If a first number n of communications is established, n set-up messages SU are transmitted. However, to facilitate the understanding of the figure, the set-up messages SU are represented by one arrow. Effectively, the set-up message SU is repeated n times.

As a part of the set-up message SU the mobile user equipment MUE informs the access network AN about communications that should be handed over.

Afterwards and/or simultaneously an access network AN of the first access system, especially a Universal Mobile Telecommunication System UMTS, commands the mobile user equipment MUE to perform measurements.

The type of measurements is adapted to physical parameters of the access systems. Examples of the measurements are: radio link measurements, intra-frequency measurements, Inter-

frequency measurements, or traffic volume measurements.

A measurement report MRT is send from the mobile user equipment MUE to the access network AN.

The access network AN contains a device DPH, capable of deciding, whether a handover is necessary and a logical element LE for deciding which communications are handed over.

If the device DPH decides, that a handover is necessary, the procedure continues as described below.

An access network AN of the first access system sends a handover query HQ to a mobile user equipment MUE.

Afterwards the mobile user equipment sends a handover response HRP to the access network AN. The access network informs a core network CN that a handover is required by at least one handover request signal HRQ.

The core network CN informs a base station controller BSC of the second access system, especially a Global System for Mobile Communication GSM, that it requests a handover by sending a handover request signal HRE to the base station controller BSC.

Afterwards the base station controller BSC sends a message for handover request acceptance HREA to the core network CN.

Within the first access system, especially a Universal Mobile Telecommunication System UMTS a handover command HCM is send to the access network AN of the first access system.

The access network AN transmits afterwards the handover command HCM to the mobile user equipment MUE. The mobile user equipment MUE sends a handover access HAC to the base station controller BSC.

The base station controller BSC send afterwards a handover detect signal HDT to the core network CN.

After completing the handover the mobile user equipment MUE sends a handover complete HCP signal to the base station controller BSC.

The base station controller BSC sends the handover complete signal HCP to the core network CN.

Before a communication between a mobile user equipment MUE and a first access system of a communication system is disconnected, it is necessary, to release the communication.

If a first number n of communications has been established and a second, lower number m of communications is handed over, n-m communications have to be released.

For every communication which is not handed over, a release command RCM and a release complete signal RCP are send. The release command RCM is send from the core network CN to the mobile user equipment MUE. The release complete signal RCP is send from the mobile user equipment MUE to the core network CN.

Effectively, the release command RCM and the release complete signal RCP are repeated n-m times to release n-m communications. However, to facilitate the understanding of

the figure, the release command RCM and the release complete signal RCP set-up messages SU are represented by two arrows.

To clear the communication the core network CN sends a clear command CCM to the access network AN. The access network AN sends afterwards a clear complete signal CCP to the core network.

Claims

1. A ~~multiple access~~ communication system with at least two different access systems, wherein a first access system is capable of handling a first number of communications between a mobile user equipment (MUE) and the first access system and wherein a second access system is capable of handling a second number of communications between the mobile user equipment (MUE) and the second access system, characterised in that the mobile user equipment (MUE) and/or the communication system contains at least one means for making a decision which communications are handed over in the case that the mobile user equipment (MUE) would move between the first access system and the second access system and in that the mobile user equipment (MUE) and/or the communication system contain at least one means for executing the decision.

2. The communication system according to claim 1, characterised in that the communication system contains at least one means for determining a capability of the communication system.

3. The communication system according to claim 2, characterised in that the means for determining the capability is located in a core network (CN).

4. The communication system according to any of the claims 1 to 3, characterised in that at least one access network (AN) of the communication system contains the means for executing the decision.

5. The communication system according to any of the claims 1 to 3, characterised in that a core network (CN) contains the means for executing the decision.

6. The communication system according to any of the claims 1 to 3, characterised in that the mobile user equipment (MUE) contains the means for executing the decision.

7. The communication system according to any of the claims 1 to 6, characterised in that at least one access network (AN) of the communication system contains the means for making a decision.

8. The communication system according to any of the claims 1 to 6, characterised in that a core network (CN) contains the means for making a decision.

9. The communication system according to any of the claims 1 to 6, characterised in that the mobile user equipment (MUE) contains the means for making a decision.

10. The communication system according to any of the claims 1 to 9, characterised in that it contains a means for deciding whether a handover is necessary.

11. The communication system according to any of the claims 1 to 10, characterised in that the means for deciding whether a handover is necessary is a device (DPH).

12. The communication system according to claim 11, characterised in that the device (DPH) is located in an access network (AN).

13. The communication system according to claim ~~12~~ 11, characterised in that the device (DPH) is located in a ~~Mobile Services Switching~~ Centre.

14. The communication system according to claim 13, characterised in that the device (DPH) is located in a ~~Base Transceiver Station~~.

15. Method for managing a ~~multiple-access~~ communication system, with at least two different access systems, wherein a first access system is capable of handling a first number of communications between a mobile user equipment (MUE) and the first access system and wherein a second access system is capable of handling a second number of communications between the mobile user equipment (MUE) and the second access system, characterised in that it is evaluated if a handover from the first access system to the second access system should be effected, wherein in the case that the handover is necessary it is selected which communications are handed over.

16. The method according to claim 15, characterised in that an access network (AN) sends a handover query to the mobile user equipment (MUE).

17. The method according to claim 16, characterised in that before the access network (AN) sends the handover query (HQ) to the mobile user equipment (MUE), the access network signals a core network (CN).

18. The method according to claim 17, characterised in that the core network (CN) adds information about

communications which can be supported.

19. The method according to any of the claims 15 to 18, characterised in that the mobile user equipment (MUE) informs the access network (AN) about the communication or the communications which should be handed over to the second access system.

20. The method according to claim 19, characterised in that the mobile user equipment (MUE) informs the access network (AN) about the communication or the communications which should be handed over to the second access system at a communication set-up.

21. The method according to any of the claims 15 to 20, characterised in that the mobile user equipment (MUE) receives a handover query (HOQ) for handover towards the second access system, the mobile user equipment (MUE) disconnects all connections, that it cannot keep in the second access system.

22. The method according to any of the claims 15 to 21, characterised in that the core network (CN) decides which communications shall be handed over to the second access system.

23. The method according to any of the claims 15 to 22, characterised in that the core network (CN) disconnects all communications which can not be kept in the second access system.

24. The method according to any of the claims 15 to 23, characterised in that at least one decision about

communications which are handed over in the case that the mobile user equipment (MUE) would move between the first access system and the second access system depends on at least one pre-setting.

25. The method according to claim 24, characterised in that the pre-setting is located within a mobile user equipment.

26. The method according to claim 25, characterised in that the pre-settings are transferred to the core network within an ... (IOE) message and/or in a set-up (SU) message.

27. The method according to claim 25, characterised in that a message which depends on the pre-setting is sent to the core network (CN) after the core network (CN) has sent a request to the mobile user equipment (MUE).

28. The method according to claim 27, characterised in that the message depends only on the pre-setting.

29. The method according to claim 27, characterised in that the message depends also on an active decision of a mobile user.

30. The method according to claim 24, characterised in that the pre-setting is stored within the network.

31. The method according to claim 30,

characterised in that the pre-setting depends on individual profiles for mobile users.

32. The method according to claim 30, characterised in that the pre-setting is identical for all users.

33. The method according to any of the claims 24 to 32, characterised in that the pre-setting differentiates between different categories of communications.

34. The method according to any of the claims 15 to 33, characterised in that at least one of the communications is put on hold before the handover and kept on hold after the handover.

Summary:

The invention relates to a multiple access communication system with at least two different access systems, wherein a first access system is capable of handling a first number of communications between a mobile user equipment (MUE) and the first access system and wherein a second access system is capable of handling a second number of communications between the mobile user equipment (MUE) and the second access system.

According to the invention the communication system contains at least one means for making a decision which communications are handed over in the case that the mobile user equipment (MUE) would move between the first access system and the second access system.

The invention further relates to a method for managing a multiple access communication system.

List of reference signs:

	AN	access network
	BSC	base station controller
5	DPH	device for deciding if a handover is performed
	CN	core network
	DCO	disconnect order
	EE	execution element
	GSM	Global System for Mobile Communication
10	HAC	handover access
	HCP	handover complete signal
	HDT	handover detached signal
	HQ	handover query
	HRE	handover request
15	HREA	handover request acceptance
	HRP	handover response
	HRQ	handover required
	LE	logical element
	MUE	mobile user equipment
20	UMTS	Universal Mobile Telecommunication System

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FIG 1

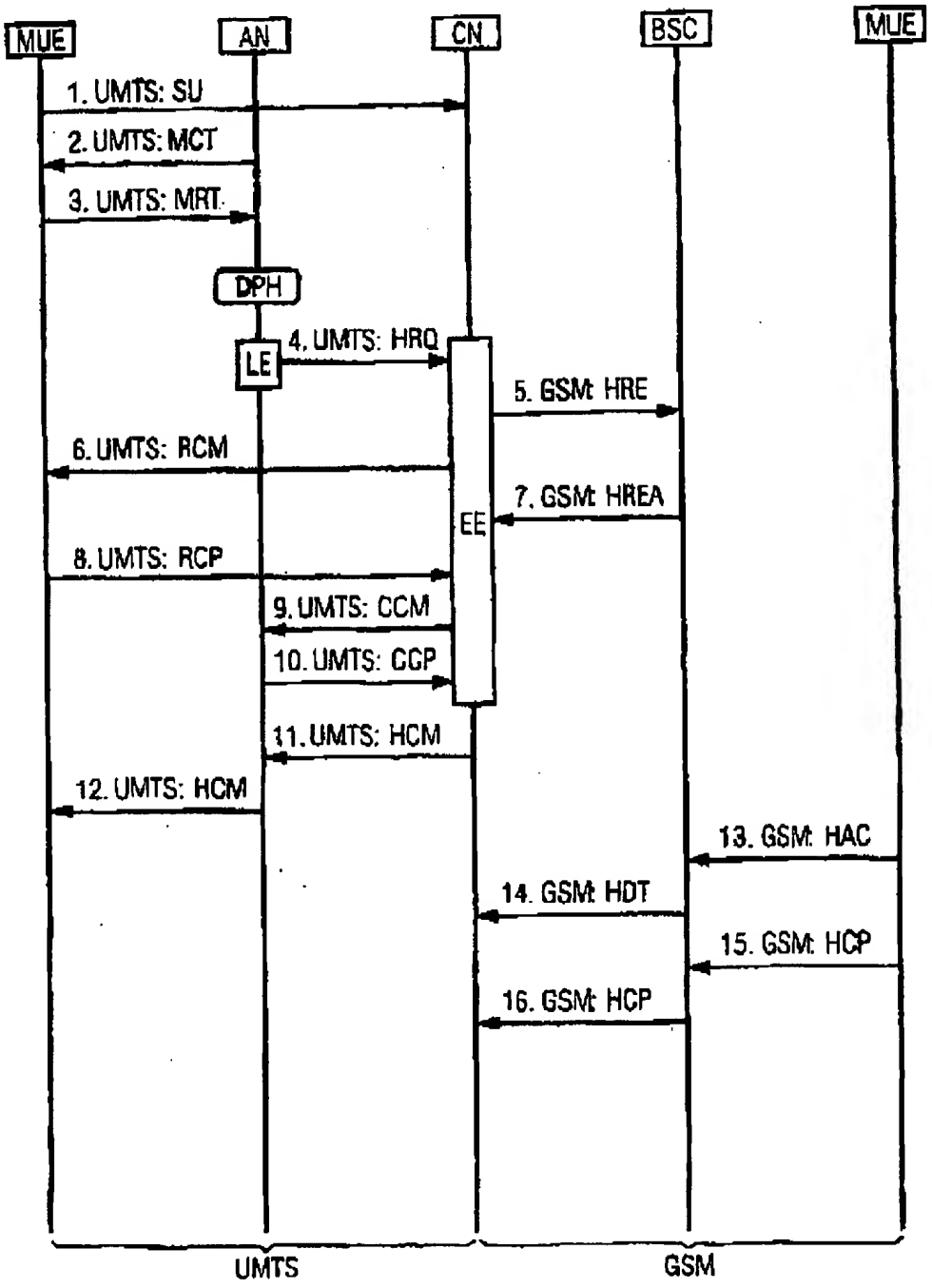

FIG 2

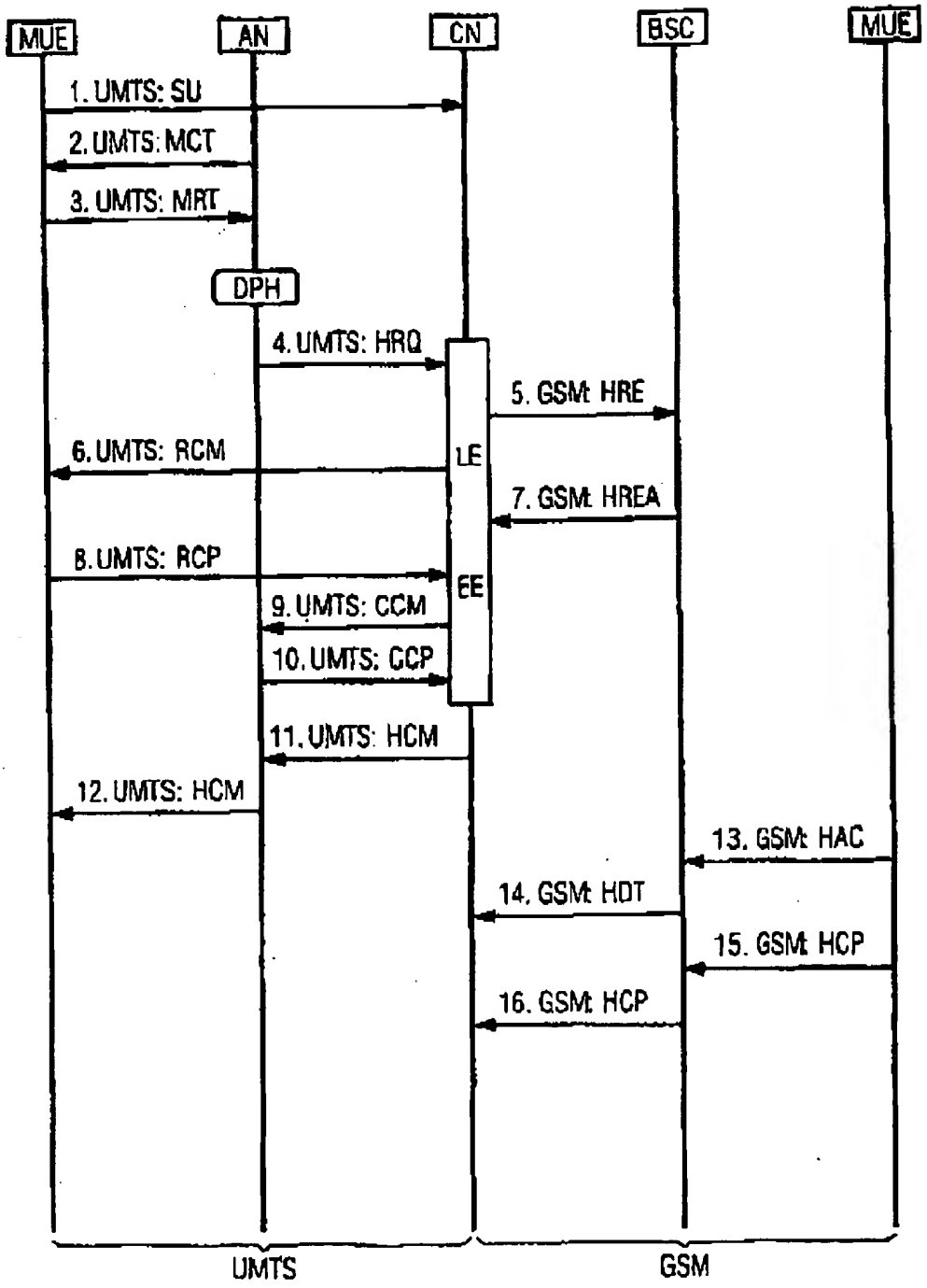
MUE
AN
CN
BSC
MUE
1. UMTS: SU
2. UMTS: MCT
3. UMTS: MRT
DPH
4. UMTS: HRQ
5. GSM: HRE
6. UMTS: RCM
LE
7. GSM: HREA
8. UMTS: RCP
EE
9. UMTS: CCM
10. UMTS: CCP
11. UMTS: HCM
12. UMTS: HCM
13. GSM: HAC
14. GSM: HDT
15. GSM: HCP
16. GSM: HCP
UMTS
GSM

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FIG 3

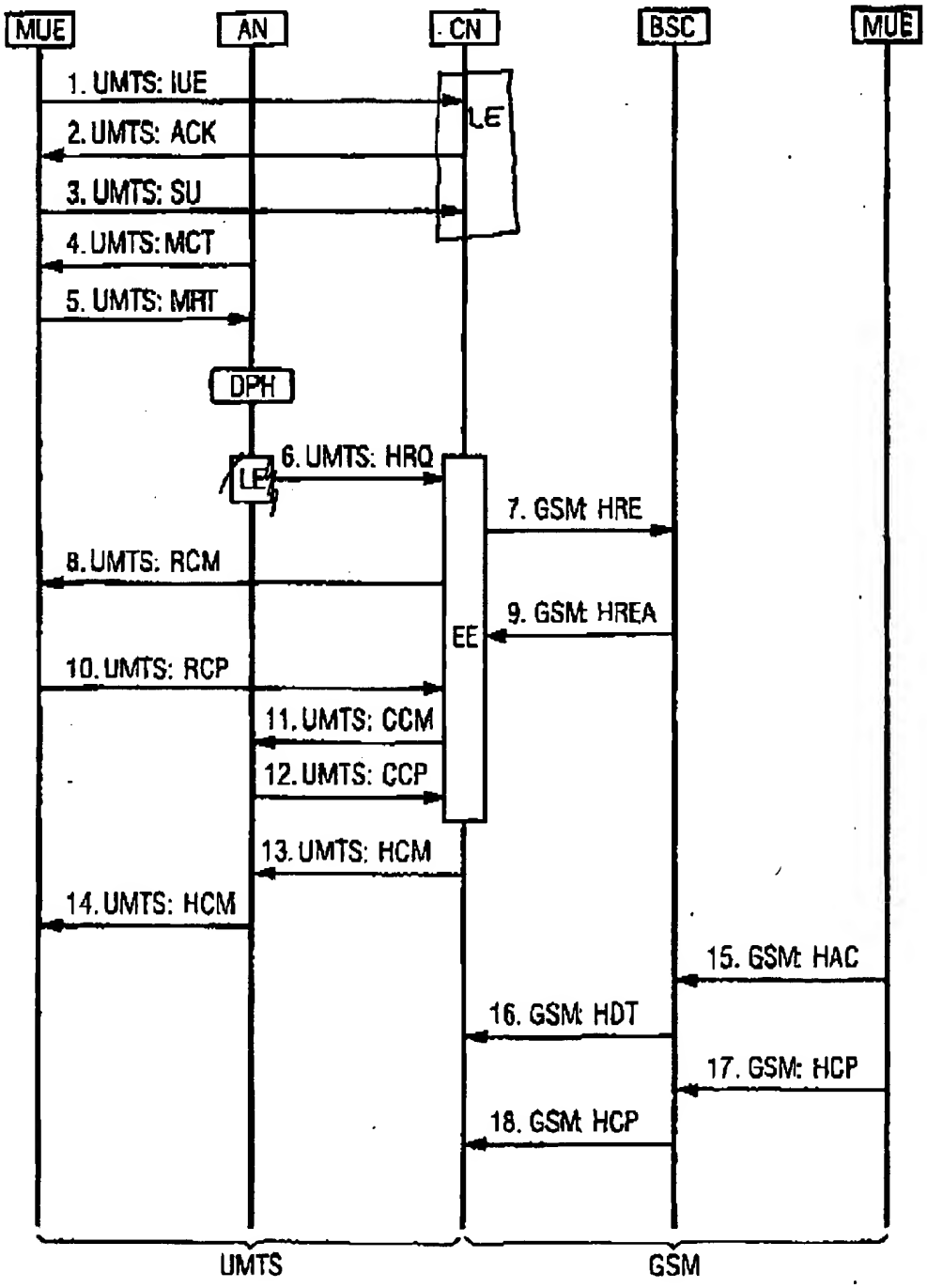

FIG 4

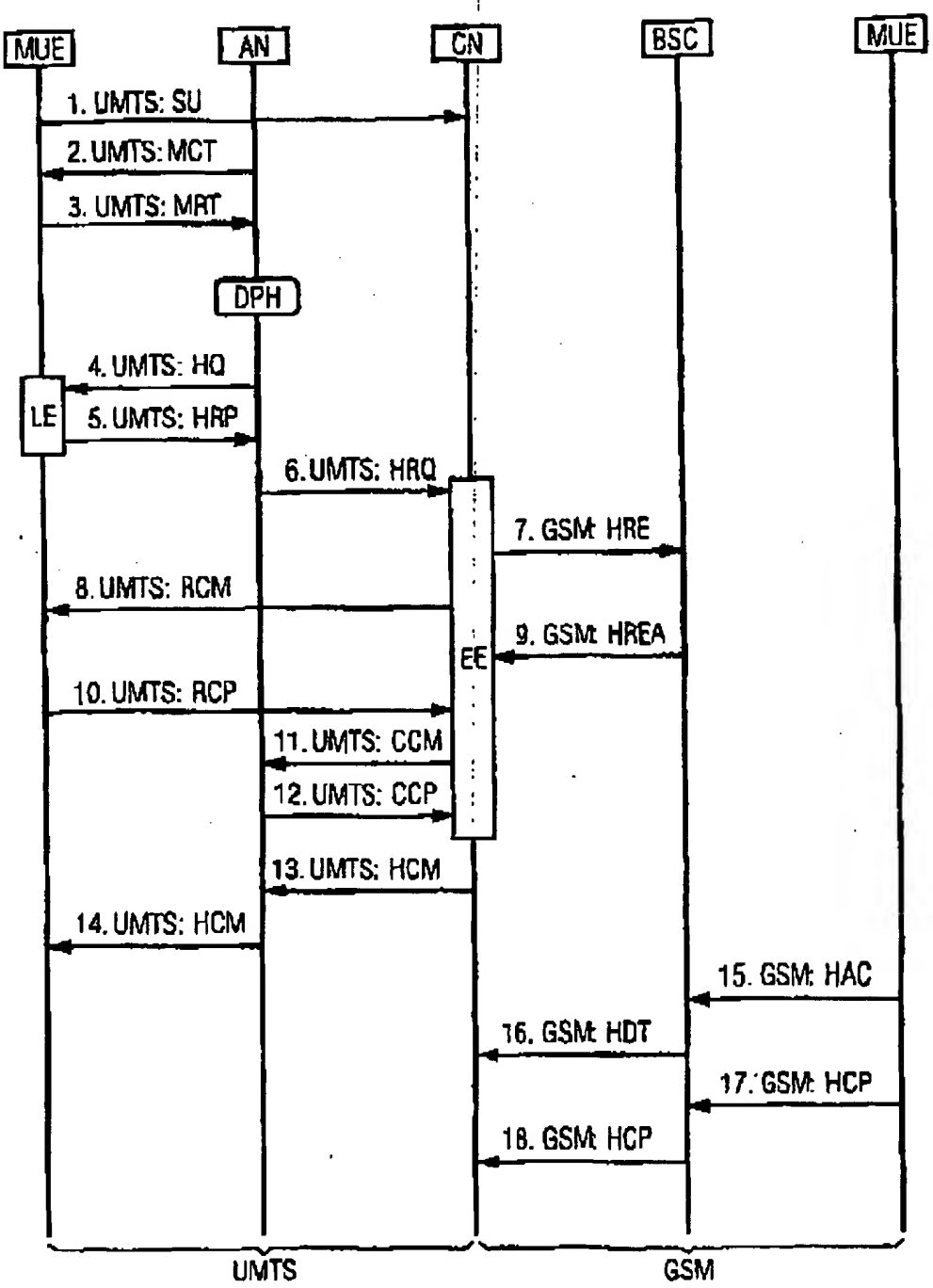
MUE
AN
CN
BSC
MUE
1. UMTS: SU
2. UMTS: MCT
3. UMTS: MRT
DPH
4. UMTS: HQ
LE
5. UMTS: HRP
6. UMTS: HRQ
7. GSM: HRE
8. UMTS: RCM
9. GSM: HREA
EE
10. UMTS: RCP
11. UMTS: CCM
12. UMTS: CCP
13. UMTS: HCM
14. UMTS: HCM
15. GSM: HAC
16. GSM: HDT
17. GSM: HCP
18. GSM: HCP
UMTS
GSM

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FIG 5